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# Growth factor

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(Redirected from Growth factors)

The term growth factor refers to a naturally occurring protein capable of stimulating cellular growth,<sup>[1]</sup> proliferation and cellular differentiation. Growth factors are important for regulating a variety of cellular processes.

Growth factors typically act as signaling molecules between cells. Examples are cytokines and hormones that bind to specific receptors on the surface of their target cells.

They often promote cell differentiation and maturation, which varies between growth factors. For example, bone morphogenic proteins stimulate bone cell differentiation, while fibroblast growth factors and vascular endothelial growth factors stimulate blood vessel differentiation (angiogenesis).

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## Growth factors versus cytokines

*Growth factor* is sometimes used interchangeably among scientists with the term *cytokine*. Historically, cytokines were associated with hematopoietic (blood forming) cells and immune system cells (e.g., lymphocytes and tissue cells from spleen, thymus, and lymph nodes). For the circulatory system and bone marrow in which cells can occur in a liquid suspension and not bound up in solid tissue, it makes sense for them to communicate by soluble, circulating protein molecules. However, as different lines of research converged, it became clear that some of the same signaling proteins the hematopoietic and immune systems used were also being used by all sorts of other cells and tissues, during development and in the mature organism.

While *growth factor* implies a positive effect on cell division, *cytokine* is a neutral term with respect to whether a molecule affects proliferation. In this sense, some cytokines can be growth factors, such as G-CSF and GM-CSF. However, some cytokines have an inhibitory effect on cell growth or proliferation. Yet others, such as Fas ligand are used as "death" signals; they cause target cells to undergo programmed cell death or *apoptosis*.

## Classes of growth factors

Individual growth factor proteins tend to occur as members of larger families of structurally and evolutionarily related proteins. There are many families which are listed below:

*This list is incomplete; you can help by expanding it ([http://en.wikipedia.org/w/index.php?title=Growth\\_factor&action=edit](http://en.wikipedia.org/w/index.php?title=Growth_factor&action=edit)).*

- Bone morphogenetic proteins (BMPs)
- Epidermal growth factor (EGF)
- Erythropoietin (EPO)
- Fibroblast growth factor (FGF)
- Granulocyte-colony stimulating factor (G-CSF)
- Granulocyte-macrophage colony stimulating factor (GM-CSF)
- Growth differentiation factor-9 (GDF9)
- Hepatocyte growth factor (HGF)
- Insulin-like growth factor (IGF)
- Myostatin (GDF-8)
- Nerve growth factor (NGF) and other neurotrophins
- Platelet-derived growth factor (PDGF)
- Thrombopoietin (TPO)
- Transforming growth factor alpha(TGF- $\alpha$ )
- Transforming growth factor beta (TGF- $\beta$ )
- Vascular endothelial growth factor (VEGF)

## Uses in medicine

For the last two decades, growth factors have been increasingly used in the treatment of hematologic and oncologic diseases and cardiovascular diseases like:

- neutropenia
- myelodysplastic syndrome (MDS)
- leukemias
- aplastic anaemia
- bone marrow transplantation
- angiogenesis for cardiovascular diseases

## See also

- Wound healing#Overview of involved growth factors
- Signal transduction
- Receptor (biochemistry)
- Cytokine
- Angiogenesis
- Human Genome Organisation
- Growth factor receptor

## References

- <sup>^</sup> *growth factor* ([http://www.mercksource.com/pp/us/cns/cns\\_hl\\_dorlands\\_split.jsp?pg=/ppdocs/us/common/dorlands/dorland/three/000038554.htm](http://www.mercksource.com/pp/us/cns/cns_hl_dorlands_split.jsp?pg=/ppdocs/us/common/dorlands/dorland/three/000038554.htm)) at Dorland's Medical Dictionary

## External links

- MeSH *Growth+Factors* ([http://www.nlm.nih.gov/cgi/mesh/2008/MB\\_cgi?mode=&term=Growth+Factors](http://www.nlm.nih.gov/cgi/mesh/2008/MB_cgi?mode=&term=Growth+Factors))

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